SUPPLEMENTARY DATA

Figure S1. Quantum dot (QD) endocytosis characteristics of human foreskin fibroblasts (n = 3 for each time point). The amount of intracellular QDs was measured by quantifying the average fluorescence intensity per cell using image-processing software (ImageJ, NIH). The cellular uptake generally increases as the incubation time increases. Intracellular QD fluorescence intensity increases drastically with time in the first 30 minutes, and continues to increase almost linearly thereafter. Fluorescence images confirm the increase of QD accumulation in fibroblasts over time. In the present study, the fibroblasts were labeled for 30 minutes, and were then washed twice with culture medium to remove excess QDs.

Figure S2. Experimental setup and local temperature history during freezing of ETs. (A) Schematic of experimental setup. The stage consists of two independently controlled temperature reservoirs separated by a distance of 6 mm. By setting the temperatures of the reservoirs to 4 °C and -20 °C, respectively, a spatial temperature gradient was imposed on the ET that was initially at room temperature. With this freezing setup, the ET was frozen uni-directionally along the x direction. (B) Local temperature history of ETs. The temperatures at x = 0, 2, 4 and 6 mm away from the edge of the -20 °C reservoir were measured (n = 3). The cooling rates experienced by the ETs were dependent on both time and location. The maximum cooling rate was observed at x = 0 mm (17.4 °C/min), and the minimum cooling rate was 4 °C/min at x = 4 mm. The cooling rates were estimated from the slopes of the tangent lines to the temperature history at a given location when the local temperature is 0 °C.

Figure S1.

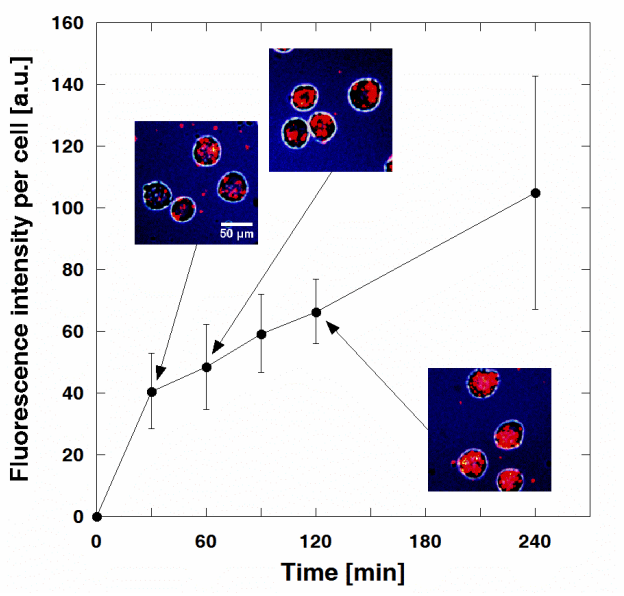
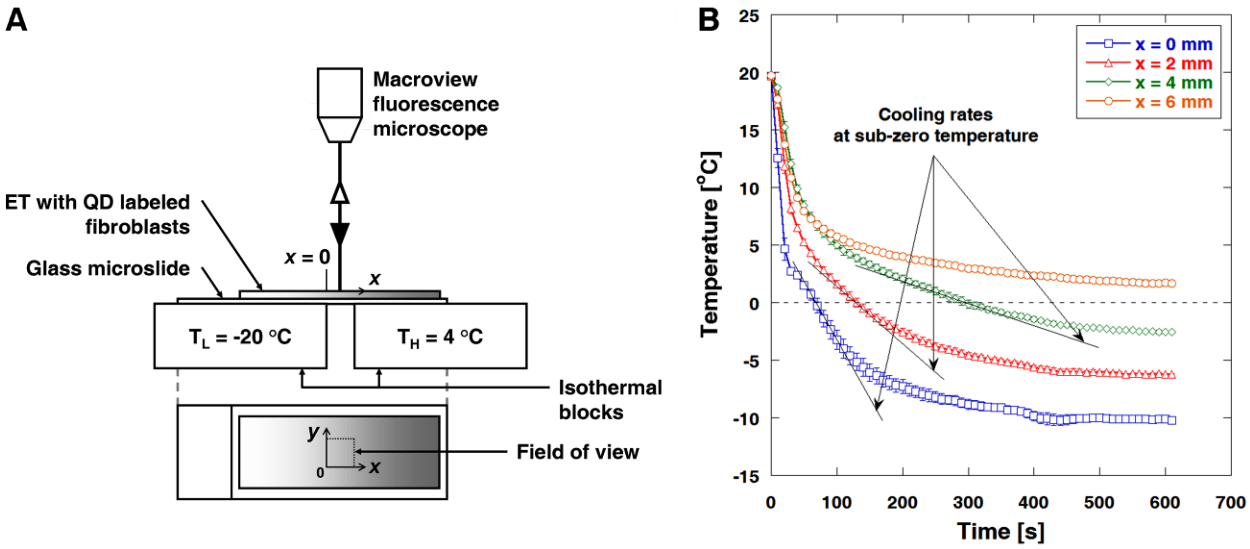

Fluorescence intensity per cell [a.u.]
160
140
120
100
80
60
40
20
0
0
60
120
180
240
Time [min]
50 µm

Figure S2.


A
Macroview
fluorescence
microscope
ET with QD labeled
fibroblasts
Glass microslide
x = 0
x
T_L = -20 °C
T_H = 4 °C
Isothermal
blocks
Field of view
y
0
x
B
x = 0 mm
x = 2 mm
x = 4 mm
x = 6 mm
Cooling rates
at sub-zero temperature
Temperature [°C]
Time [s]
25
20
15
10
5
0
-5
-10
-15
0
100
200
300
400
500
600
700